Manual extension

Crate ECH 228 x or 328 x to

Crate ECH 238 x - UPS or 338 x - UPS with CAN-Control

The crates ECH 238x - UPS and ECH 338x – UPS are supplied with a controller for remote and monitoring control via CAN-BUS. Additionally they are supplied with a battery buffer which is able to bridge AC power failures which last less than 10s and – in case of permanent AC power shut off - will manage a definite system and module shut off procedure.

Installation

After unpacking the crate has to be installed under the described condition. The provided 16 A fuse has to be given into the fuse holder on the rear side. Now the battery buffer is activated. With AC line ON the crate is in Stand-by mode.

Technical Data version 1.	
CAN bus speed	20, 50, 100 and 125 kbit/s
Analogue functions	ADC with 10-Bit resolution, control of supplies voltages and temperature of this crate.
Digital functions	ON – and OFF switch of internal supply voltages via CAN-Bus in Stand-by mode
Power-ON/OFF	Power cable connected and AC line is ON, now the crate is in Stand-by mode. In Stand-by mode the internal DC supply voltages can be switched ON and OFF with help of a push button, even if no CAN-control is present. In case of transient AC power failure the internal battery buffer supports the crate with voltage. After 10 sec a signal will be made in order to manage a definite switch OFF procedure. The battery is able to bridge ca. 1 min.

CAN-Interface

The CAN-control is configurable completely via software. Herewith structures corresponding to CAN-Open (CAL-based Draft Standard 301 / release 3.0) will used.

After Power_ON-Reset the controller runs into CAN-Status “Initialisation“. During this state Write access is possible to all EEPROM-cells via the sub identifier. If control is already configured (e.g. from factory), control is running into CAN-status “Pre-operational”.

Only in these both states it is possible to work with services Network-Management (NMT) and Distribution - Management (DBT).

CAN-Status “Pre-operational“ is necessary for the further description.

In order to allow the control of the crate via CAN-Bus, with global command „START“ the CAN-Status „Pre-operational“ will be switched into CAN-Status “Operational“:

Services	ID (with RTR=0)	DLC	DATA_1
Network - Management (NMT)			
START / STOP / RESET global	0	1	Bit 0 = 1 ⇒ Start Bit 1 = 1 ⇒ Stop Bit 2 = 1 ⇒ Reset CAN-interf. Bit 3 = 1 ⇒ Reset Controller

Now control can work via two identifier (see ID - Distribution):

1. Control (EMCY-ID)

The internal supply voltages will be controlled cyclically (V_{Meas} ca all 100 ms). The voltage control is factory fixed with $\Delta V = \pm 5\%$ given through tolerance values $V_{Trehsold}$ in an EEPROM. If the thresholds of voltage and/or temperature will be exceeding then the controller is sending a message with EMCY-ID to the Bus (send only).

Controls about EMCY-ID´s are working only after the controller was setting in Operational mode with NMT-Start.

ID	RTR	DLC	Voltage	DATA_2	DATA_3	DATA_4	DATA_5	
EMCY-ID	0	5	0 0 0 0 0 x x x	12-bit unsigned ADC-word: V_{Meas}		12-bit unsigned ADC-word: $V_{Threshold}$		xxx: 000 + 24 V = $V_{Nominal\ 0}$ 001 + 5 V = $V_{Nominal\ 1}$ 010 $24V_{Battery}$ = $V_{Nominal\ 2}$
				V_{Meas} resp. $V_{Threshold} = V_{Nominal\ x} * ADC\text{-word} / 2048$				

ID	RTR	DLC	Temperature	DATA_2	DATA_3	DATA_4	DATA_5	
EMCY-ID	0	5	0 0 0 0 0 x x x	0	T_{Meas} [°C]	0	$T_{Threshold}$ [°C]	xxx: 011 temperature sensor 1 (24V-DC PS) 100 temperature sensor 2 (Backplane) 101 temperature sensor 3 110 temperature sensor 4 (3 and 4: reserved)

ID	RTR	DLC	AC line power failure signal	DATA_2	DATA_3	DATA_4	DATA_5	
EMCY-ID	0	5	0 0 0 0 0 x x x	0	0	7	7c	xxx: 111 AC line power failure

2. Subidentifier (Sub-ID)

E-command	ID	RTR	DLC	r/w	Command							DATA_n	Remarks
Multiplex-command	Sub-ID	0	x	x	0	x	x	x	x	x	x		multiplexed DAC/ADC – work on channels of selected module (Sub-ID)
ADC	Sub-ID	0	1	1	0	1	0	0	x	x	x		Read Access, (call from host)
	Sub-ID	0	3	1	0	1	0	0	x	x	x	2 Byte ADC-word	$V_{Meas} = V_{Nominal\ x} * ADC\text{-word} / 2048$ xxx: 000 + 24 V = $V_{Nominal\ 0}$ 001 + 5 V = $V_{Nominal\ 1}$ 010 $24V_{Battery}$ = $V_{Nominal\ 2}$
	Sub-ID	0	4	1	0	1	0	0	x	x	x	2 Byte ADC-value 1 Byte fan status	ADC-value = Temperature [°C] Bit: b0 = fan1 (DC-PS) and b1 = fan 2 to 4 Fan status in b0/1: (0: stage 1, 1: stage 2, full cooling) xxx: 011 temperature sensor 1 (Backplane) 100 temperature sensor 2 (24V-DC Power supply) 101 temperature sensor 3 110 temperature sensor 4 (3 and 4: not installed)
Module-command	Sub-ID	0	x	x	1	x	x	x	x	x	x		Use module functions of selected module (Sub-ID)
EEPROM	Sub-ID	0	2	1	1	0	0	0	0	0	0	EEPROM-address	Read / Write access, (call from host)
/Tolerances	Sub-ID	0	3	1	1	0	0	0	0	0	0	Data_1: EEPROM-address	Byte oriented reading of tolerances from EEPROM-address:
	Sub-ID	0	3	0	1	0	0	0	0	0	0	Data_1: EEPROM-address Data_2: tolerance high/low	-byte oriented writing of tolerances on above EEPROM-address, tolerance = word ADC-threshold -tolerance = (calculated set-ADC-value) * (1 ± ΔV)

V	Higher ADC-threshold		Lower ADC-threshold	
	High	low	high	low
+ 24 V	0x3d	0x3e	0x4f	0x40
+ 5 V	0x41	0x42	0x43	0x44
$24V_{Battery}$	0x45	0x46	0x47	0x48

E-command	ID	RTR	DLC	r/w	Command								DATA_n								Remarks
Module-commands	Sub-ID	0	x	x	1	x	x	x	x	X	x										Use module function of selected modules (Sub-ID)
ON/OFF	Sub-ID	0	1	1	1	0	0	0	0	0	1										Read / Write Access, (call from host)
	Sub-ID	0	3	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	x	0 0 0 0 0 0 0 1	x=0... switched on x=1... switched off Read/Write Access
ON/OFF	Sub-ID	0	3	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	x	0 0 0 0 0 0 0 1	x=0... switched on x=1... switched off Write Access
Bit rate	Sub-ID	0	1	1	1	0	0	0	0	1	1										Read / Write Access, (call from host)
	Sub-ID	0	2	1	1	0	0	0	0	1	1	Data_0									Bit rate [kBit/s] Read/Write Access
Bit rate	Sub-ID	0	2	0	1	0	0	0	0	1	1	Data_0									New bit rate: only 20, 50, 100, 125 for bit rate [kBit/s] is allowed! Write Access
Unit-ID	Sub-ID	0	6	1	1	0	0	0	1	1	0	3 Byte BCD-unit-no. and 2 Byte BCD-software-release									

These identifiers will be fixed by ID - Distribution (DBT) Service:

ID - Distribution (DBT) Service	ID	DLC	DATA_1	DATA_n							remarks
DBT - Master - Request	2024d 7E8h (RTR=1)	0									Call from host only by connected module: message address and ID´s of module
DBT - Slave - Service	2023d 7E7h (RTR=0)	8	mod.-addr.	2	3	4	5	6	7	8	Message with module address and corresponding ID´s
DBT - Master - Service	2024d 7E8h (RTR=0)	8	Mod.-addr.	ADC-ID		EMCY-ID		Sub-ID		t	Allocate new ID´s t ... Inhibit-time: $t \approx 15 * (\text{ADC mux}) * t$ ms
DBT - Master - Service ⇓	2024d 7E8h (RTR=0)	2	0x80	module-addr.							Call from host to module address: message of ID´s to address
DBT - Slave - Service	2023d 7E7h (RTR=0)	8	mod.-addr.	2	3	4	5	6	7	8	Message with module address and the corresponding ID´s

The remote control module will be configured with help of Network-Management (NMT) Service:

Network - Management (NMT)	ID	DLC	DATA_1	remark
NMT - Slave - Service (only in initialising mode)	2025d 7E9h	2	Mod.-addr. (0xFF)	After stop of CAN-Status (0x20): 0x80: Operational 0x40: Pre-operational 0x20: Initialisation
NMT - Master - Service	2026d 7EAh	2	Mod.-addr. old	Mod.-Adr. new, **Addr. 0x80 forbidden !**
Start / Stop / Reset	0	1	Bit 0 = 1 ⇒ Start Bit 1 = 1 ⇒ Stop Bit 2 = 1 ⇒ Reset CAN-Interf. Bit 3 = 1 ⇒ Reset Controller	

Warning

There is no maintenance for the crate and the battery necessary. In case of no use of this crate during 6 month it is necessary to connect the crate to power, switch into ON at least for 8h to charge the batteries. The battery has to be renewed after 5 years.